

Network Group Addressing

Considerations for standard conventions

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Token ring supports group addressing to help filter unwanted messages from specific collections of nodes. New local station software permits increased use of group addressing. There is a need to establish some local conventions for group addressing on the Fermilab token ring network.

Needs of local stations for group addressing

1. Time-of-day message is sent to a functional group address.
2. Destination address for alarms. Alarms are normally sent to a group address so that local stations, and other interested nodes, can receive and display them for local consumption.
3. Data requests using the Classic protocol use group addressing to avoid sending multiple frames when more than one other node is referenced in a single data request.
4. Memory settings may be directed to group addresses using the appropriate internal node# reference. This can permit "gang" program downloading.

Standardized group addressing already selected

1. Time-of-day message sent by a local station that receives the NBS clock signal uses group functional address C000-4000-0000.
2. D0 alarms use group functional address C000-2000-0000.
3. NWA alarms use group functional address C000-1000-0000.
4. IBM software reserves group functional addresses in the range C000-0000-4000 through C000-0000-0002.
5. The token ring chipset uses functional group address C000-0000-0001 for the ring monitor node.

Local station configuration of group addresses used

There is a table of 16 group addresses stored within the TRING table in non-volatile memory. At reset time, these 16 addresses are copied to another table which is referenced by the network transmit driver using the internal node# values in the range 00F0-00FF. In this way, the system can refer to group addresses as a word value. The meaning of internal node# 00FF is forced to the broadcast network address of C000-FFFF-FFFF.

1. Time-of-day is sent to internal node# 00FE.
2. Alarms are sent to the destination node# in the 4th word of the PAGEM system table (currently based at address 00102000). D0 uses the internal node# 00F0 for this purpose.
3. Data requests, when sent to multiple nodes, are sent to the destination node in the 3rd word of the PAGEM system table.

Token ring chipset support of group addressing

1. All nodes receive all broadcast frames.
2. A node may elect to receive frames addressed to a single "group address." It is specified in the Open Parameter List that is used to open onto the network. This group address is a 31-bit value.
3. A node may elect to receive frames addressed to any set of up to 31 bit-significant "group functional addresses." There are 16 bits available for the "user" to specify so as not to conflict with IBM standard conventions. These user bits are in the range C000-4000-0000 through C000-0000-8000.

Problem looking for a solution

How can we utilize the available choices to support the needs of Fermilab's token ring network?

<i>Internal node#</i>	<i>Address</i>	<i>Purpose</i>
00F0	C000-2000-0000	Alarms destination (D0 example)
00F1		
00F2		
00F3		
00F4		
00F5		
00F6		
00F7		
00F8		
00F9		
00FA	C000-0400-0000	All local stations data requests
00FB		
00FC	C000-CC49-4E41	'LINA' Linac program downloading
00FD	C000-C45A-524F	'DZRO' D0 program downloading
00FE	C000-4000-0000	Time-of-day
00FF	C000-FFFF-FFFF	Pure broadcast

Alarms destination node address depends upon the node's use:

C000-2000-0000	D0 alarms (D0 protocol)
C000-1000-0000	NWA alarms (D0 protocol)
C000-0800-0000	Linac alarms (accelerator protocol)

Values for words 3 and 4 in PAGEM table:

00FA	All local stations data requests (+ name translation)
00F0	Alarms destination

Nodes have optional group address and optional function group addresses:

Assign group addresses to denote downloadable groups.

Assign functional address bits for time-of-day, data requests, alarms.

The parameter page on the small consoles uses group addressing in two different ways. One is when a user types a name (6-character accelerator name or 12+4 character D0 name). The other is when there is more than one non-local node represented in the list of channels on the page. This is done so that only a single network message must be sent, even if all 14 lines are of different nodes. The node that is used for either of these cases is the node# in the 3rd word of the PAGES system table mentioned above.

One might elect to choose to restrict name look-up to a limited number of nodes by careful selection of group addressing. For example, name requests could be sent only to D0 nodes by using the group address given above for D0 node program downloading. This would work for name look-up.

The same group address would also be used when sending data requests to more than one external node. For this it would not work properly. When the data request is sent, if any node does not respond, then another request will be reissued to that specific node(s) that did not respond. It knows which ones did not respond because it examines the list of analog channel ids, each of which includes the node#. This treatment is given repetitive data requests only. One-shot requests are not given this service. For this reason, the analog descriptors (including text, names and engineering units scale factors) may not be collected if the group address used does not address some node(s) in the list.

Also, if a local station is used as a data server node, which collects data on behalf of another node's request, the group address of the data server node will determine which nodes are reachable.

In any case, entering a node:chan on a local station parameter page with no other non-local nodes represented in the list will address the given node directly without using any group addressing. This means that the group addressing cannot prevent access to any given node. It can only restrict name look-ups.

Current alarm generating software in the local station software emits Classic protocol alarms, unless 3 special D0 Device Information Block system tables exist, in which case it emits D0 protocol alarm messages. It does not emit both on the network. When a D0 alarm message is received from the network, a local station converts it into a Classic format alarm message for optional local display.

It is necessary to emit alarms in the accelerator protocol for processing by Aeolus on the accelerator Vax. Some means must be found to select this option for Linac local stations.

Accelerator alarm messages include an EMC (Error Message Code) that must be unique throughout the accelerator system. This is done by including a sub-system byte in the EMC so that different sub-systems cannot conflict. There is an alarm status word, a reading value, and up to 15 words of optional parameters also included in the alarm message.

In order for a local station to be able to receive and display accelerator alarm messages locally, additional information is required that is not needed by Aeolus. It can be included in the optional parameters, as they are not now used by the Linac front end. It is the time-of-day that the alarm occurred, the alarm flags (a variation of the alarm status word), and the analog channel name or binary status bit text or comment text (such as a system reset message).

With the above plan, a local station that receives an accelerator protocol alarm message can convert it into the Classic form for optional local display just as is done for the case of D0 protocol alarm messages.